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ANALYSIS OF TECHNOLOGY GAPS AND RELATIVE IMPORTANCE OF JASMINE BUDWORM, HENDECASIS DUPLIFASCIALIS HAMPSON IN TAMIL NADU

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ABSTRACT

Surveys were conducted during 2015-2016, in major jasmine growing districts of Tamil Nadu, for assessing the distribution, infestation level and the relative importance of jasmine budworm, Hendecasis duplifasialis Hampson. The budworm incidence was more in Madurai (45.18 %) followed by Tiruneveli (41.35%), Dindugal (33.54 %) and Coimbatore districts (29.78 %). Fifty three per cent respondents ranked budworm as the most important pest. The technological gap indices (TGI) were high in adopting right frequency in spraying of chemicals (91 %), usage of biological control agents (87 %) and effective cultural practices viz., regular raking of soil to destroy pupa (85 %) and collection and destruction of fallen and discolored buds and flowers (82 %). A majority of respondents (52.94 %) had high level of technological gap, whereas, only 11.76 % were in low level of technology gap. Thus, efforts should be taken to create awareness among jasmine growers for the use of eco-friendly bio-control methods against jasmine budworm as well as other pests of jasmine.

KEYWORDS: Jasmine Budworm, Bore Hole, IPM & Technological Gap Index

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Original Article

INTRODUCTION

Jasmine is one of the most marketable traditional flowers of India. It has gotten importance in all religious, social and cultural ceremonies (Thakur *et al.*, 2014). In India, largest area under jasmine cultivation is in Tamil Nadu and Karnataka from where it is distributed to metropolitan cities. Jasmine is cultivated in an area of more than 8,000 ha with an annual production of flowers worth Rs. 80-100 million in India. Tamil Nadu is the leading producer of jasmine in the country with an annual production of 77, 247 tonnes from an area of 9,360 ha (Prakash and Muniandi, 2014). The production of Jasmine is affected by various factors, among which, insect pests are the most devasting factor. Major pests affecting jasmine are jasmine budworm (*Hendecasis duplifascialus* Hampson), galleryworm (*Elasmopalpus jasminophagus* Hampson.), leaf webworm

Nausinea geometralis Guenee.), leaf roller, (*Glyphodes unionalis* Hubner.), blossom midge (*Contarinia maculipennis* Felt.) and red spider mite (*Tetranychus* urticae. Koch.). Of these, budworm gains major

economic importance, as it causes excessive damage to buds. The budworm, *H. duplifascialis* larva bores into closed immature buds and feed on the inner floral structures during initial stage. It makes a circular hole on the corolla tube, emerges and tunnels to move into other buds of the same shoot. Infested flowers turn pinkish violet in colour and fall off prematurely. In case of severe infestation, adjacent flower buds are webbed together by means of silken threads and feed on petals also. As these tiny larvae feed on flower buds, the marketable quality of the flowers (is greatly reduced

Jasmine farmers were forced to undertake frequent sprays of pesticides to control the pests. Insecticides were found to be highly effective, rapid in curative action and adoptable to all situations. Frequent application and large scale use of chemical insecticides for the control of these pests lead to health hazards, outbreaks of secondary pests, environmental pollution, accumulation of pesticide residues and reduction in biodiversity of natural enemies (Balasubramanian and Swamiappan, 1993). Integrated Pest Management (IPM) techniques comprising physical, chemical and biological measures are essential for effective and eco-friendly management of pests. As the farmers are end users and the final decision-makers for the adoption of any technology, it is essential to know their knowledge about the pests and practices recommended for pest management. However, least attention has been paid to assess the farmer's perception. Hence, considering the economic losses caused by this pest, this study was undertaken to assess the incidence of jasmine budworm in major jasmine growing districts of Tamil Nadu and to assess farmer's perception on the awareness about this pest and its relative importance over other key pests of jasmine.

MATERIALS AND METHODS

Surveys were conducted during 2015-2016 in ten major jasmine growing districts (Figure 1) for assessing the distribution of jasmine budworm in Tamil Nadu. The study areas were selected based on the extent of cultivation of the crop. From each selected village, 5 to 10 jasmine growing farmers were randomly selected and the data was collected by means of a structured questionnaire prepared in local language administered via personal interviews (Pinyupa *et al.,* 2009). The questionnaire composed of the list of different pests in jasmine and the pest which ranks first.

Information was collected on awareness of respondents about the months of severity of pest incidence and the management practices carried out by them. The data sets were compiled and tabulated before subjecting to statistical analysis. Technological Gap Index (TGI) was computed to analyze the extent of adoption of various recommended practices related to budworm management using the formula (Sakthivel *et al.,* 2012).

$$\text{Technological Gap Index (TGI)} = \frac{R-A}{R} \times 100$$

Where, R = Recommended practice

A= Adopted practice

On account of a wide range of technological gap, the Jasmine growers were categorized as 'High' for those having TGI of 70 and above, 'Medium' and 'Low' having TGI between 40 and 70 and below 40 respectively.

The data on budworm incidence was transformed to $\sqrt{x}+0.5$ and were compared using Latin Square Distribution (LSD).

RESULTS AND DISCUSSIONS

Incidence of Jasmine Budworm in Different Districts of Tamil Nadu

The incidence of jasmine budworm was observed in all the ten districts of Tamil Nadu. However, the incidence was maximum in Madurai district recording 45.18 per cent and Tirunelveli district recording 41.35 percent, followed by Dindugal district (33.54 per cent) and Coimbatore districts (29.78 per cent). The lowest per cent incidence was recorded in Thootukudi district (12.43), Erode district, (14.31), Virudhunagar district (15.37) and Theni district (15.52) (Table 1).

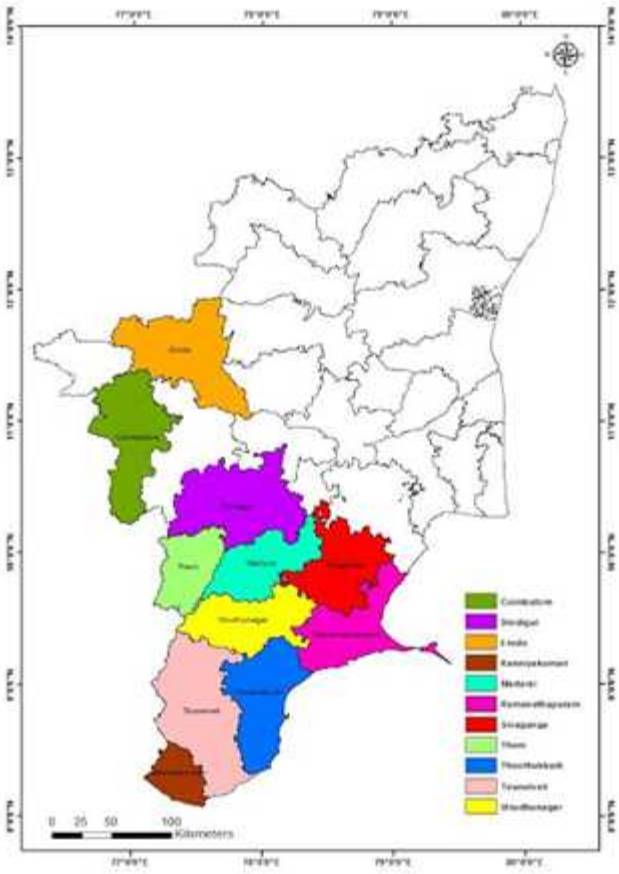

Figure 1: Map Showing the Study Site

Similar trend was noticed in the number of larvae/plant in Madurai district recording the maximum number of 10.2 per plant followed by Tirunelveli district with 8.6 per plant. Thus, it is inferred that jasmine budworm density was high in Southern districts of Tamil Nadu and the hot weather in the region might be the probable reason for the pest buildup (Prasad and Logiswaran, 1997).

Relative Importance of Jasmine Budworm and Perception among Jasmine Growers

Majority of respondents (94%) knew about jasmine budworm and among them 53% ranked it as the most important pest (Figure 2). The respondents who ranked blossom midge as the most important pest was 16%, whereas 9% perceived leaf webworm and 7% recorded red spider mite as a major problem.

Nearly half of the respondents (51 %) felt that the incidence of jasmine budworm is severe in May-August, medium (30.00%) in February to April, while the September-November was 19 per cent only (Figure 3). Similar results were reported by Vanitha (2001) in Southern districts of Tamil Nadu.

Table 1: Frequency Distribution and Incidence of Jasmine Budworm by Jasmine Growers (N=100)

S. No.	Districts	No. of Larva/Plant	% Budworm Incidence
1	Kanyakumari	3.8^{cd}(1.95)	22.47^{d}(4.68)
2	Tirunelveli	8.6^{b}(2.93)	41.35^{a}(6.13)
3	Thootukudi	2.6^{d}(1.61)	12.43^{e}(3.31)
4	Virdhunagar	2.2^{de}(1.48)	15.37^{e}(3.58)
5	Madurai	10.2^{a}(3.19)	45.18^{a}(6.44)
6	Ramanathapuram	3.4^{d}(1.84)	27.15^{cd}(4.97)
7	Theni	1.8^{eg}(1.34)	15.52^{e}(3.66)
8	Dindugal	2.4^{de}(1.55)	33.54^{b}(5.97)
9	Erode	1.4^{g}(1.18)	14.31^{e}(3.73)
10	Coimbatore	4.6^{c}(2.14)	29.78^{bc}(5.19)
	SEd CD(0.05)	0.1045 0.2680	0.2180 0. 0.5591

Each value is the mean of three replications; Figures in parentheses are square root transformed values.

In a column, means followed by common alphabet (s) is / are not significantly different by LSD at P=0.05

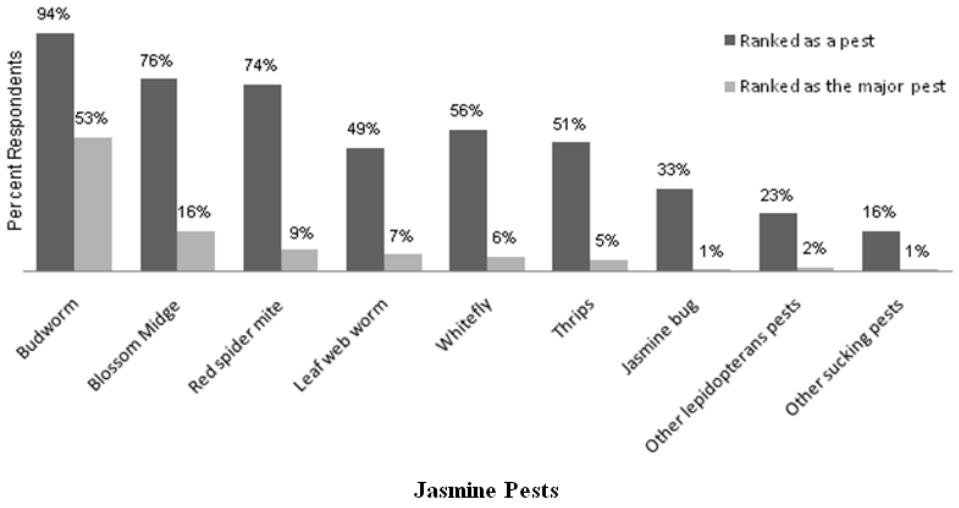

Figure 2: Frequency Distribution and Ranking of Jasmine Pests by Jasmine Farmers (N=100)

Technology Gap Indices (TGI) on Management Practices of Jasmine Budworm among Jasmine Growers

Jasmine budworm is ranked as the major pest of jasmine. Cultural control measures like field sanitation (86.00%) was followed by majority of Jasmine growers, thus recorded lower TGI. This is due to the ease of the practice, which can be done while doing day to day field works. The TGI was found high in other cultural/mechanical practices *viz.*, regular mulching, weeding and raking of soil to expose pupa, as these operations are labor intensive, thus not commonly followed by the farmers. Regarding the usage of bio-control agents, farmers are less educative and only an average of 13 percent respondents use *Bt, Tricho* egg cards and release *Chrysoperla eggs* with a TGI of 87 per cent. The main reason was the lack of awareness about biological control, less and slow relief on biocontrol agents and their unavailability (Bale *et al.*, 2008). In case of chemical control, comparatively medium TGI was observed, which is due to the ease of application and availability of chemicals.

Regarding the frequency of application of chemicals, there is a long technology gap (91 per cent), as the lack of patience and swift reaction by the farmers on seeing even a pink bud or larva in the bud by spraying indiscriminately

without any proper interval. Farmers who send flowers to export market are spraying once in two, three and four days to minimize the incidence of budworm, which causes pink buds, in order to avoid their products from being rejected for export.

Distribution of Respondents

Majority of the respondents (51 %) belonged to the high technological gap category, whereas, 30 % under medium technology gap category. Only 19 % of the respondents were found in low level of technology gap. The adoption gap

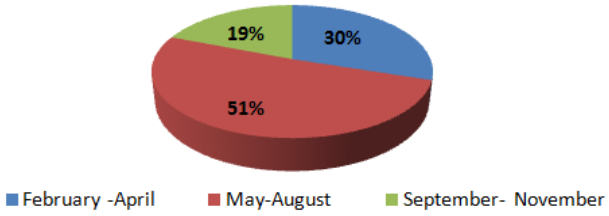

Figure 3: Perception of Respondents on Temporal Incidence of Jasmine Budworm (N=100)

Table 2: Technological Gap at Farmer's Level in Adopting Recommended Management Practices for Jasmine Budworm (N=100)

S. No.	Particulars of practices*	Respondents (%)	Technological gap (%)
A.	Cultural/mechanical Practices		
	1. Field sanitation	86.00	14.00
	2. Collection and destruction of fallen and discoloured buds and flowers	18.00	82.00
	3. Light traps for monitoring the adult movement	27.00	73.00
	4. Regular mulching	53.00	47.00
	5. Regular weeding	41.00	59.00
	6. Regular tilling or raking of soil to destroy pupa.	15.00	85.00
	7. Pruning the bushes in winter	91.00	9.00
B.	Biological Control		
	8. Spray *Bacillus thuringiensis* @2 g/litre	16.00	84.00
	9. *Beauvaria bassiana* @ 1x 10^8 spores g^{-1}	13.00	87.00
	10. Use of *Trichogramma* egg cards	14.00	86.00
	11. Use of *Chrysoperla* eggs	10.00	90.00
C.	Chemical Control		
	12. Thiocloprid (Alanto) 240SC@ 1 ml/litre	47.00	53.00
	13. Profenophos 25EC @ 2 ml/lit	51.00	49.00
	14. Spray neem seed kernel extract or Azhadirachtin 5 % (5 ml /litre) at bimonthly intervals	48.00	52.00
	15. Basal application of carbofuran	43.00	57.00
	16. Right frequency of application of chemical pesticides	9.00	91.00

Analysis clearly indicates that among the various practices recommended for the management of jasmine budworm like application of chemicals and few cultural/mechanical practices with less complexity were more feasible and adopted. Several constraints *viz.*, unavailability of labors for carrying out cultural practices, lack of awareness about the use of bio-pesticides etc. leads to widening of technology gap. More or less similar findings were reported by Verma *et al.* (2003) and Bhagwan Singh *et al.*, (2007).

It is therefore suggested that extension agencies should intensify their efforts to organize extension educational programs like trainings, demonstrations, field days, etc., to motivate the farmers to accept and adopt the IPM practices. In the extension programs, a special emphasis should be given to promote eco-friendly bio-control methods against jasmine budworm as well as other pests of jasmine by conducting skilled demonstrations and specialized participatory trainings.

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